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Concerning the Intelligence of Raccoons. L. W. COLE. *Journal of Comparative Neurology and Psychology,* Vol. XVII., No. 3, 1907. Pp. 211-261.

In his study of the raccoon Professor Cole presents the results of one of the earliest series of experiments on the mental life of the plantigrades. The author had six young animals under observation, four males and two females. The experiments covered a period of eleven months, beginning with the animals when about eight weeks old.

He takes as his criterion of intelligence the ability of the animal to make new adjustments, or modify old ones, in accordance with the results of its individual experience. The apparatus used was that of Thorndike and Kinnaman, with slight variations. This was supplemented in discrimination experiments by a card showing device original with the author. The motives for learning under experimental conditions are assigned as hunger, an apparent desire to be occupied, and loneliness. The author concedes the "trial and error type" of learning, but thinks he finds ground for the presence of distinct memory images, including memory of the difficulty of locking devices. So-called "play trials" appeared, in which, after loosening the fastenings and escaping from the box, the animal refused to take food.

In the rapidity of forming associations with single fastenings, the raccoon is classed above Thorndike's cats and next to the monkeys. The time records show greater and more numerous variations, however, than in the case of either cats or monkeys. "All the raccoons showed a tendency to abbreviate their acts," which seems to the author to require for its explanation the presence of either an image or notion. Some would probably differ with Professor Cole at this point. The limit of memory for the most complex associations is placed at 147 days. In the opinion of the reviewer this is much too short for adult animals, his own results fixing the limit as above 250 days.

In tests for visual discrimination, the author found ability to distinguish color, but is quite ready to concede that this may be and probably is rather a discrimination of brightness. Experiments with form and size gave high percentages of right choices, the animal becoming practically perfect in performance in less than 250 trials. A high degree of ability to discriminate the pitch of sounds was also developed.

Professor Cole made rather extended repetitions of the putting-through experiments of Thorndike. He concludes, on the contrary, that "putting through after failure certainly and always results in making the next trial a success, but does not have nearly as much stamping-in power as a self-innervated movement. Further, if the act which the animal is put through is the one which will remain the easiest and most convenient for him throughout the tests, irrespective of his position in the box, he will never vary from it." In cases where no order for the performance of acts is determined the raccoon was never able to mechanize into a settled routine. The author argues that the ability to learn by being put through gives strong experimental evidence of the presence of ideas. "It seems to me," he says, "that animals which are utterly unable to learn save by innervating their own muscles must be devoid of ideas." Professor Cole also attributes to his raccoons the ability to perform a "species of counting," which appeared in experiments involving the display of color cards in twos and threes.

By way of summary the author makes the following statements:

1. "In the rapidity with which it forms associations the raccoon seems to stand almost midway between the monkey and the cat. In the complexity of the association it is able to form it stands nearer the monkey."
2. "Long practiced motor associations show a good degree of permanence."
3. "The raccoon discriminates form, sizes, and tones. It also discriminates cards of different colors and intensities."
4. "I have no evidence that the raccoon imitates its fellows."
5. "The raccoon learns various acts from being put through them, and thus gives evidence of the presence of visual images."

Since the present paper is considered by the author as preliminary in character, we are led to expect that at some future time more extended experimental data will be offered in support of his contention that the raccoon can count and give evidence of mental imagery. It is not impossible that the apparent counting ability may find similar explanation to that given by Professor Pfungst in his study of "Kluge Hans," the young stallion of Berlin. It is rather unfortunate that Professor Cole should have confined his entire paper to the results of his laboratory experiments, in view of the fact that he also had many observations on the development of instincts in the young animals during the period of the first twelve months, which marks the stay of the young with the mother. Data have been given, however, which offer ground for comparison with those from experiments on other animals under similar conditions, which was the limit set for the study.

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JOURNALS AND NEW BOOKS

REVUE DE METAPHYSIQUE ET DE MORALE. March, 1908. *Le Dieu de Spinoza* (pp. 129–163): V. BROCHARD. – There is no real difference between the concept of God in Spinoza's "Ethics" and that in the "Tractatus Theologico-Politicus." *Du rôle de la logique dans la formation scientifique du droit* (pp. 164–189): E. MEYNIAL. – Logically, law appears as the matter of a purely deductive system, but it is also a means of effecting the equilibration of conflicting interests. From the first of these facts it gets its stability, from the second its plasticity and adaptability. *La méthode en chemie* (pp. 190–213): A. JOB. – Chemistry explains species by assemblages of atoms, and metamorphoses by transference of energy, but atoms and energy are not definitive concepts for it. Progress is to be looked for from taking physics for an instrument and guide, and biology for an application and model. *Études critiques: La*